

LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES



**OFFICE OF FISHERIES
INLAND FISHERIES SECTION**

PART VI -B

WATERBODY MANAGEMENT PLAN SERIES

LAKE CONCORDIA

**WATERBODY EVALUATION &
RECOMMENDATIONS**

CHRONOLOGY

DOCUMENT SCHEDULED TO BE UPDATED ANNUALLY

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WATERBODY EVALUATION

STRATEGY STATEMENT

Recreational

Sport fish species other than bass, are managed to provide sustainable populations while providing anglers the opportunity to catch or harvest numbers of fish adequate to maintain angler interest and efforts. Bass anglers are afforded the opportunity to catch quality-sized largemouth bass through the introduction of Florida largemouth bass. Hybrid striped bass are stocked to provide an open water predatory species to utilize the abundant shad population and provide additional recreational fishing opportunities.

Commercial

Commercial species of fish are managed to provide a sustainable population.

Species of Special Concern

No threatened or endangered fish species are found in this lake. However, Lake Concordia is one of a few landlocked Mississippi oxbow lakes with a self-sustaining population of gulf pipefish.

EXISTING HARVEST REGULATIONS

Recreational

This water body is managed under statewide regulations for all fish species. The Louisiana Department of Wildlife and Fisheries recreational fishing regulations may be viewed at the link below:

<http://www.wlf.louisiana.gov/fishing/regulations>

Commercial

The LDWF commercial fishing regulations may be viewed at the link below:

<http://www.wlf.louisiana.gov/fishing/regulations>

Special Gear Restriction

R.S. 56:22 (B) prohibits the use of gill nets, trammel nets, and fish seines.

SPECIES EVALUATION

Recreational

Largemouth Bass

Largemouth bass are targeted as a species indicative of the overall fish population due to their high position in the food chain. Electrofishing is the best indicator of largemouth bass abundance and size distribution, with the exception of large bass. Spring and fall

electrofishing are used to determine population trends, age and growth, and genetic information. Gill net sampling is used to determine the status of large bass and other large fish species.

Relative abundance and size structure indices

Electrofishing has been used to collect largemouth bass population data in Lake Concordia since 1989. Spring and fall electrofishing data are used to develop information which serves as indicators of LMB relative abundance for various size classes from year to year. Total combined CPUE for LMB is found in Figure 1 and Figure 2. Total catch-per-unit-effort (CPUE) for LMB size groups greater than 8 inches total length (TL) is charted in Figure 3 and Figure 4. Fish populations fluctuate due to various factors. The LMB population in Concordia is no exception. Initial electrofishing sampling began in Concordia Lake in 1989 and continues through 2012. Electrofishing sampling indicated the LMB population increased from 1991 until it reached a peak in 1998. This LMB population increase may be the result of increased stocking efforts by the LDWF. Concordia Lake was designated a Trophy Lake in 1990 and received priority stocking from 1990 thru 2002. It was stocked annually with 100,000 LMB fingerlings.

From 1998 through 2000, the LMB population declined slightly; however, the overall population remained above the long-term average. Largemouth bass populations continued to decline from 2001 until 2008. The reason for this decline is unknown, but may be due to several factors. In 2001, the lake was removed from Trophy Lake designation and 2002 was the last year the lake received 100,000 fingerlings. Largemouth bass stocking was reduced to 10,000 fingerlings bi-annually. Also, the presence of the largemouth bass virus was discovered in the lake in 2001. The virus caused widespread LMB mortality. Due to the extended nature of the event, an accurate assessment of mortality was not determined. During this same time period, severe drought conditions are suspected to have reduced spawning success in area lakes, including Lake Concordia. Since 2008, LDWF sampling indicates the LMB population has rebounded steadily with the 2012 CPUE being the highest recorded since 1998 (Figure 2).

Fall electrofishing data is used to determine LMB relative weight (W_r) which is the ratio of a fish's weight to the weight of a standard fish of the same length. Largemouth bass W_r below 80 are indicative of a potential problem with forage availability. In Figure 5 and Figure 6 below, W_r values are shown for LMB since 1989. The lowest W_r found in all size classes was 86 in 1998. The consistently high W_r 's for Lake Concordia LMB indicate a population with abundant and available forage.

A 15"-19" protected slot limit was in effect for LMB on Lake Concordia from 1991-2001. Consideration to rescind the regulation was prompted in part by growing angler dissatisfaction. The size restriction was removed by LDWF Commission rule. Subsequent sampling data indicates an improved growth rate for Age 1 bass (Figure 7). LMB regulations for Lake Concordia are now consistent with statewide regulations.

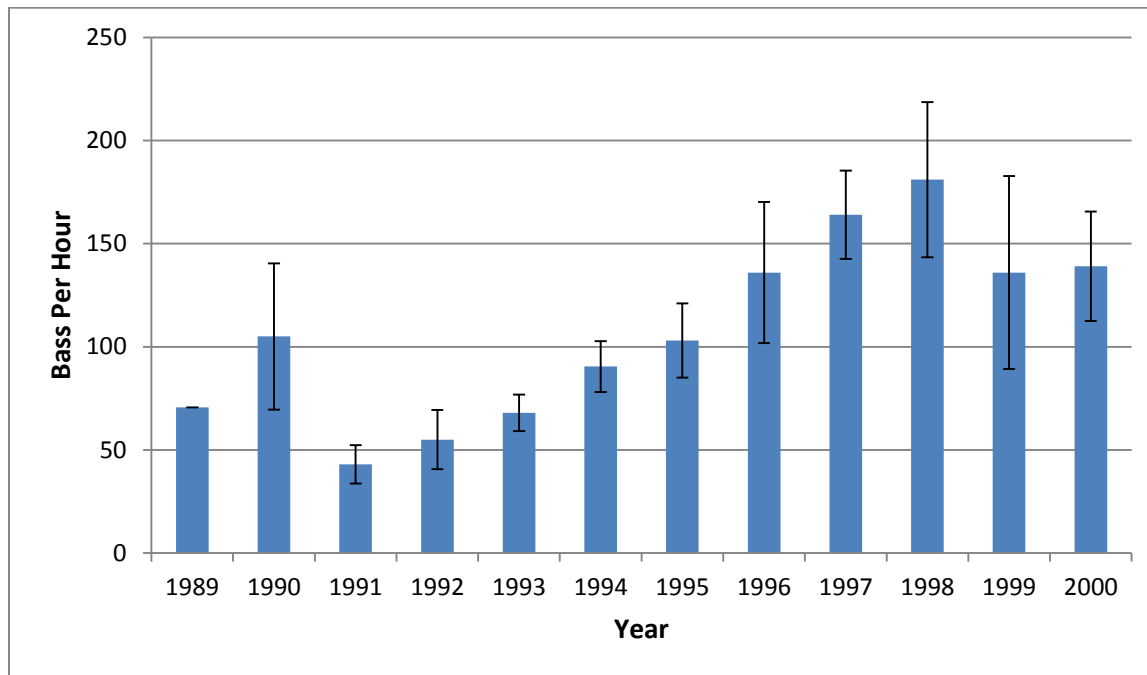


Figure 1. The total CPUE (\pm SE) for largemouth bass on Lake Concordia, Louisiana, spring electrofishing results from 1989 – 2000. Error bars represent standard error of total CPUE.

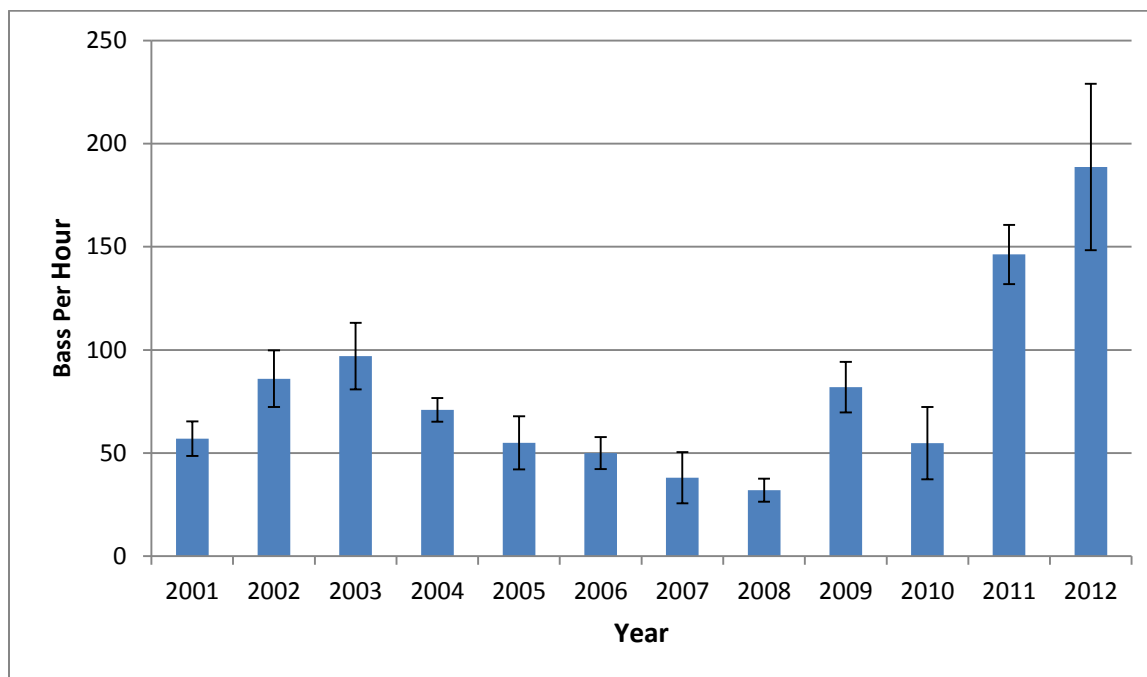


Figure 2. The total CPUE (\pm SE) for largemouth bass on Lake Concordia, Louisiana, spring electrofishing results from 2001 – 2012. Error bars represent standard error of total CPUE.

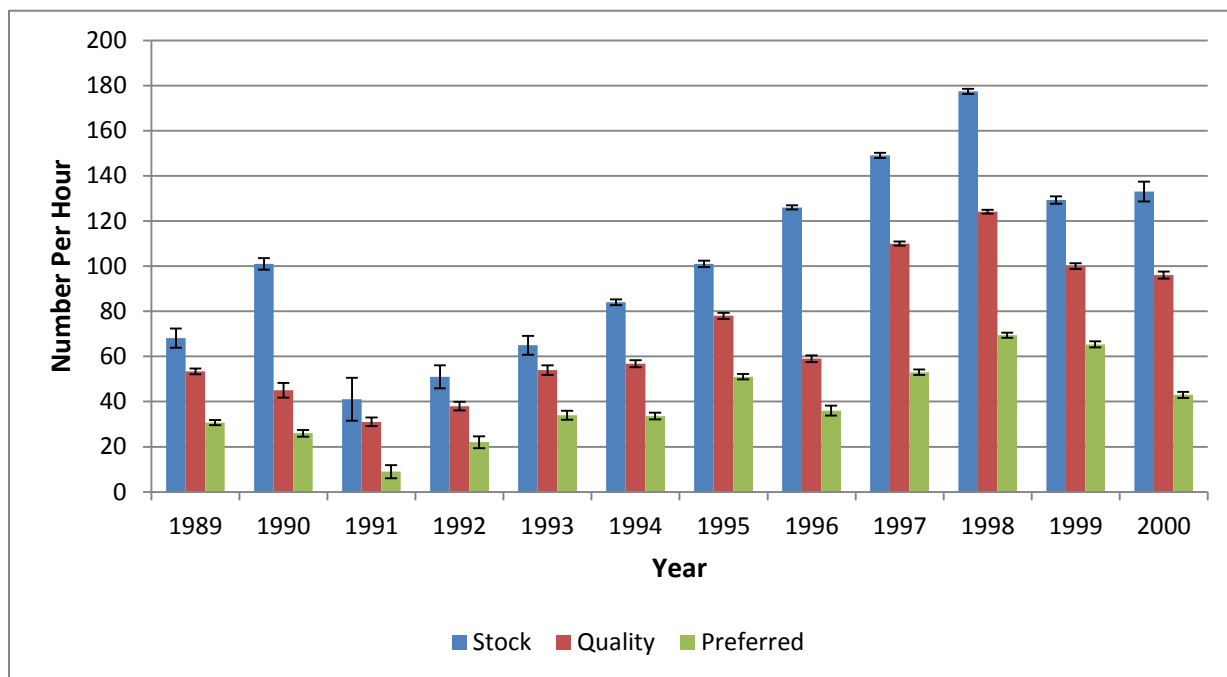


Figure 3. The mean CPUE (\pm SE) for stock-, quality-, and preferred-size classes of largemouth bass on Concordia Lake, Louisiana for spring season from 1989 – 2000. Note: The 15 – 19 inch protected slot was in effect from 1991 – 2001.

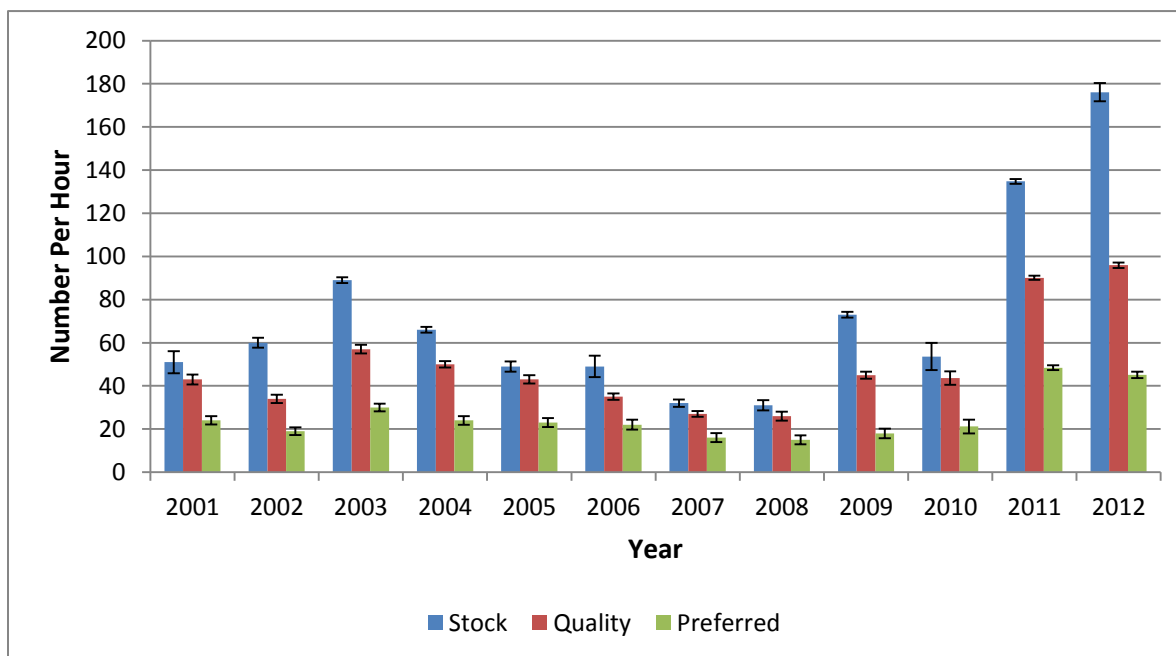


Figure 4. The mean CPUE (\pm SE) for stock-, quality-, and preferred-size classes of largemouth bass on Lake Concordia, Louisiana for spring season from 2001 – 2012. Note: The 15 – 19 inch protected slot was in effect from 1991 – 2001.

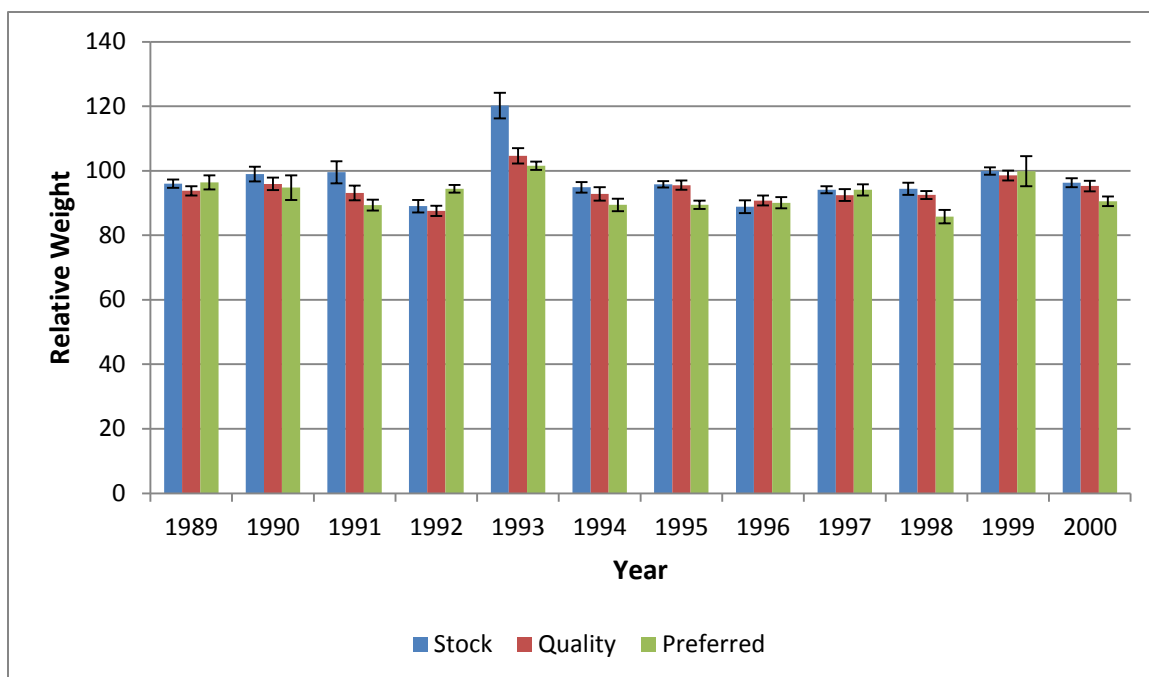


Figure 5. Mean relative weights (\pm SE) for stock-, quality-, and preferred-sized largemouth bass collected during fall electrofishing in Lake Concordia, Louisiana from 1989 thru 2000.

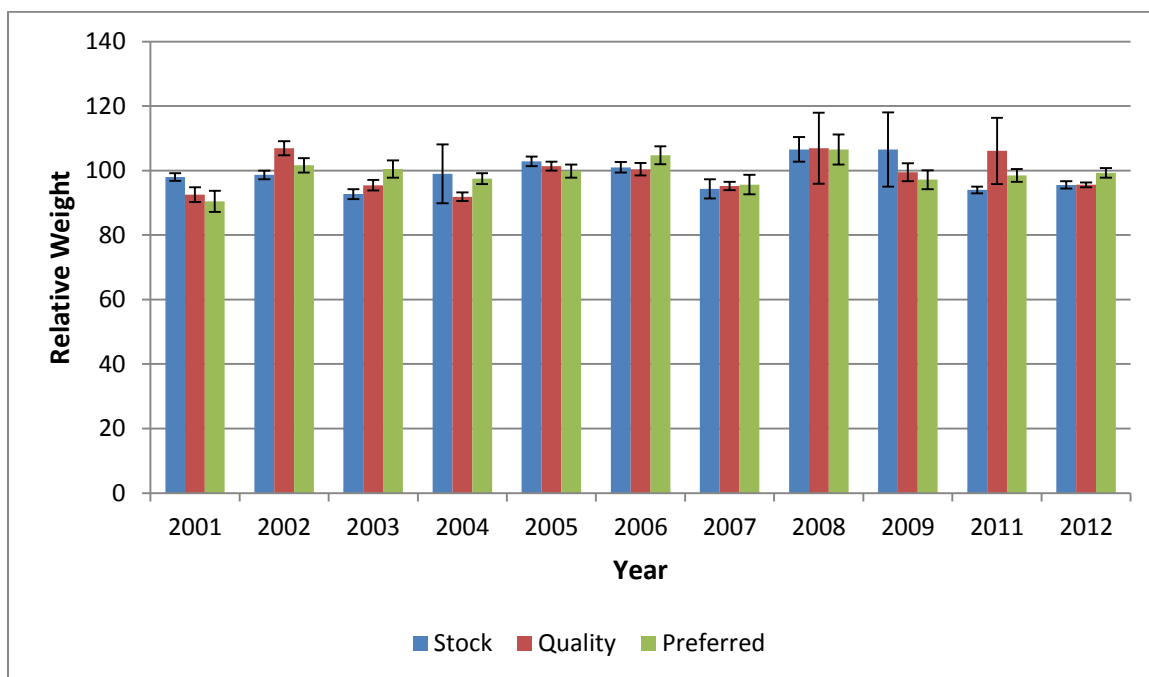


Figure 6. Mean relative weights (\pm SE) for stock-, quality-, and preferred-sized largemouth bass collected during fall electrofishing in Lake Concordia, Louisiana from 2001 thru 2012.

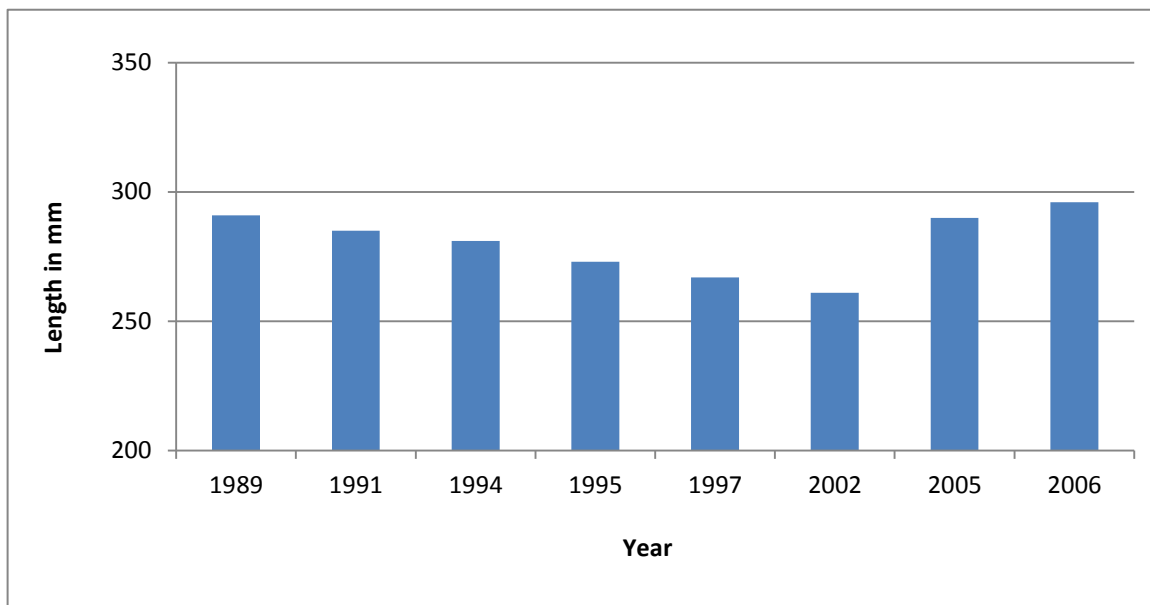


Figure 7. Mean length at capture for age 1+ largemouth bass from Lake Concordia, LA, from 1989 thru 2006.

Largemouth bass age and growth

Age and growth data for Concordia LMB were collected in 1997 and in 2010, 2011, and 2012 electrofishing samples. The results of these samples are listed in Figure 8 and Figure 9 and in the LMB stock assessment study section below. Growth rates of LMB in Lake Concordia were similar to other Mississippi River oxbow lakes, which are generally at, or above the state average. Concordia growth rate is similar to other Mississippi River oxbow lakes that generally have higher growth rates than less fertile upland reservoirs.

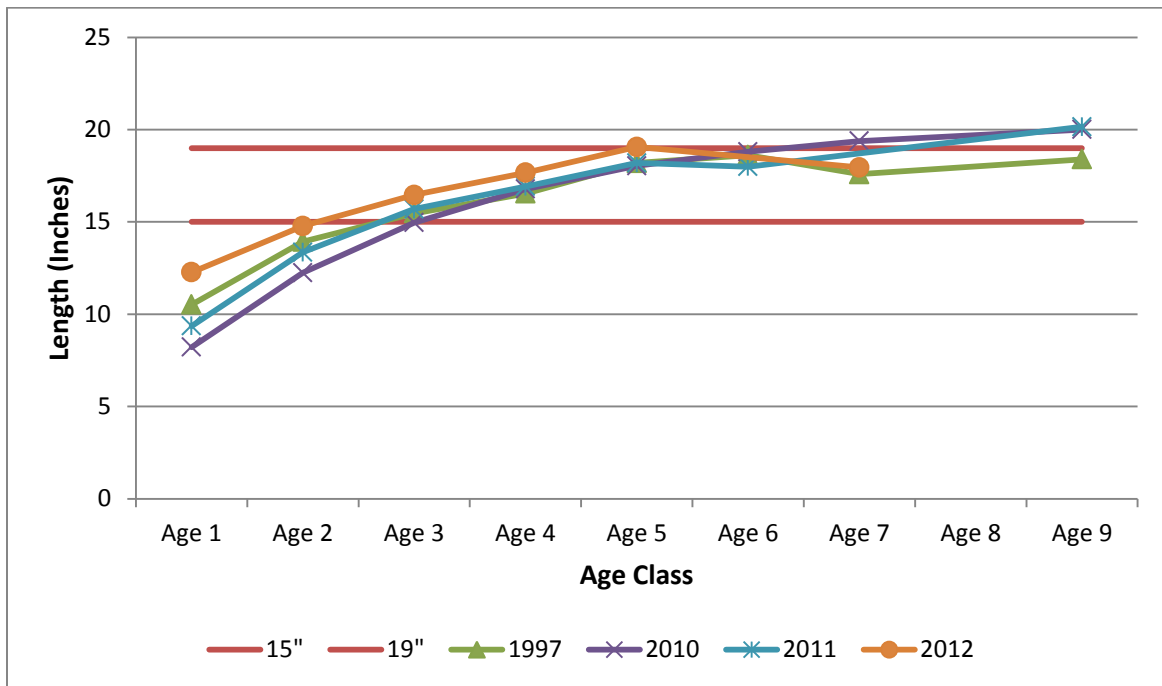


Figure 8. Mean length at capture for largemouth bass from Lake Concordia, Louisiana for 1997, 2010, 2011 and 2012. The 15 to 19 inch protected slot is displayed as red horizontal lines.



Figure 9. Average length at age of capture for largemouth bass in Lake Concordia, Louisiana in 1997 and 2010-2012.

Largemouth bass stock assessment-

The Department of Wildlife and Fisheries (LDWF) conducted a three year stock assessment study on largemouth bass (LMB) in Lake Concordia from 2010 – 2012. Additionally, a creel survey of anglers was conducted within the same three year period.

The objectives of the study were to:

- Develop a statewide database that will include both population-level and human-dimension components of Louisiana (LA) LMB fisheries.
- Evaluate current and alternative harvest regulations of LA LMB populations.
 - Evaluate LA LMB angler behavior and perception of current harvest regulations.
 - Assess the effects of LMB harvest regulations on the fisheries.
- Use the results of the study to help redefine LA LMB management goals and update the LDWF Black Bass Management Plan (1989).

Every fish population is the product of a unique set of influences, both natural and man-induced. A thorough understanding of those influences and the corresponding population response is essential to good fisheries management. As part of a statewide effort, the Louisiana Department of Wildlife and Fisheries recently completed a study to describe the Lake Concordia largemouth bass population. The project included data collection over a three year period from 2010 – 2012. Population dynamics including relative abundance, spawning success, growth, body condition, mortality, and longevity were measured. Lake Concordia anglers were also surveyed to determine their collective influence on the LMB population.

Electrofishing gear was used by fisheries biologists to collect LMB from Lake Concordia each spring. Length and weight measurements were recorded for each fish, and ear bones (called otoliths) were removed from approximately 42% of the sampled fish for age and growth analyses. Annual growth rings on the otoliths provide an accurate measurement of fish age. Size and age for all of the sample fish were combined to generate estimates of average growth rate and longevity. Angler surveys were conducted during the sample period to document fishing effort, angler catch rate and harvest rates.

Figure 10 illustrates that Lake Concordia supports a healthy bass population with some LMB reaching 22 inches. Good representation of fish in the 8 to 16 inch range was observed in all years of the project. It is important to note that spring sampling typically does not include fingerling size bass. However, the recurring presence of small (age-1) bass indicates consistently successful reproduction.

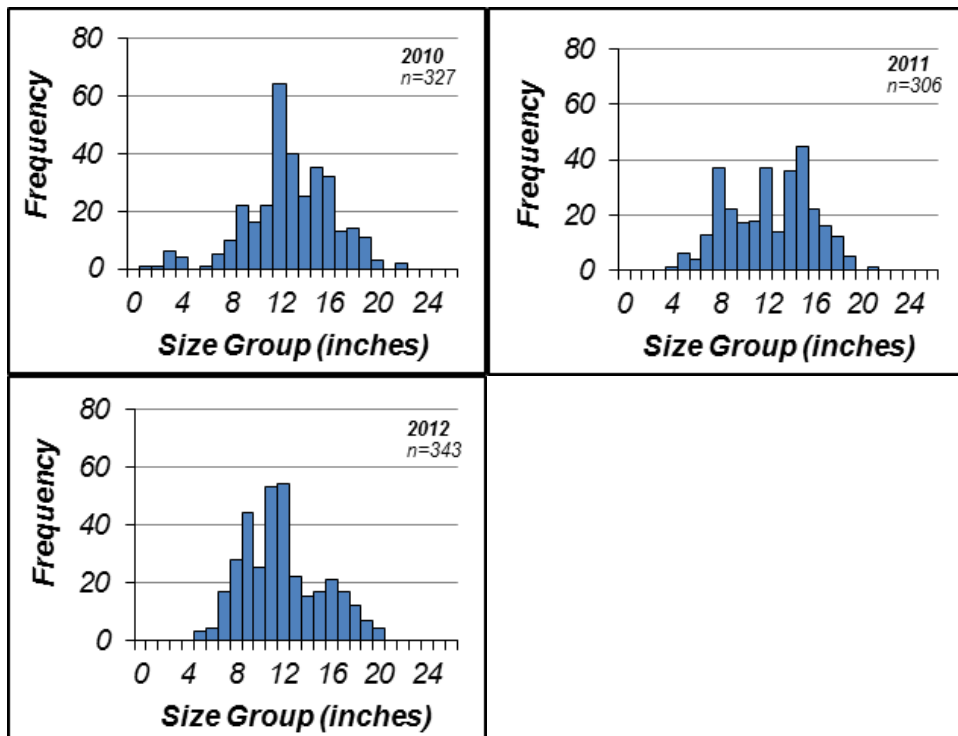


Figure 10. Annual length distributions of largemouth bass collected from Lake Concordia during spring electrofishing surveys in 2010-2012. Sample sizes (n) are presented in each graphic.

Age structure of the complete electrofishing sample (2010-2012) is shown in Figure 11. Fifty-five percent of the total sample was comprised of age-1 and age-2 bass. The majority of the age 7+ and older fish were females. While bass up to 8 years old were found, only a small percentage of Lake Concordia LMB were 6 years and older. Average length at age for Lake Concordia bass is provided in Table 1. Growth is rapid through age-4, but then slows to only an inch or less per year.

Body condition for Lake Concordia bass can be described as very robust. Good physical condition of bass generally is the product of an adequate food supply that is readily available to predation.

There is average recruitment of age-1 LMB into the Lake Concordia population. Contributing factors include stable water levels, abundant forage, and sufficient spawning substrate and protective cover for fingerlings.

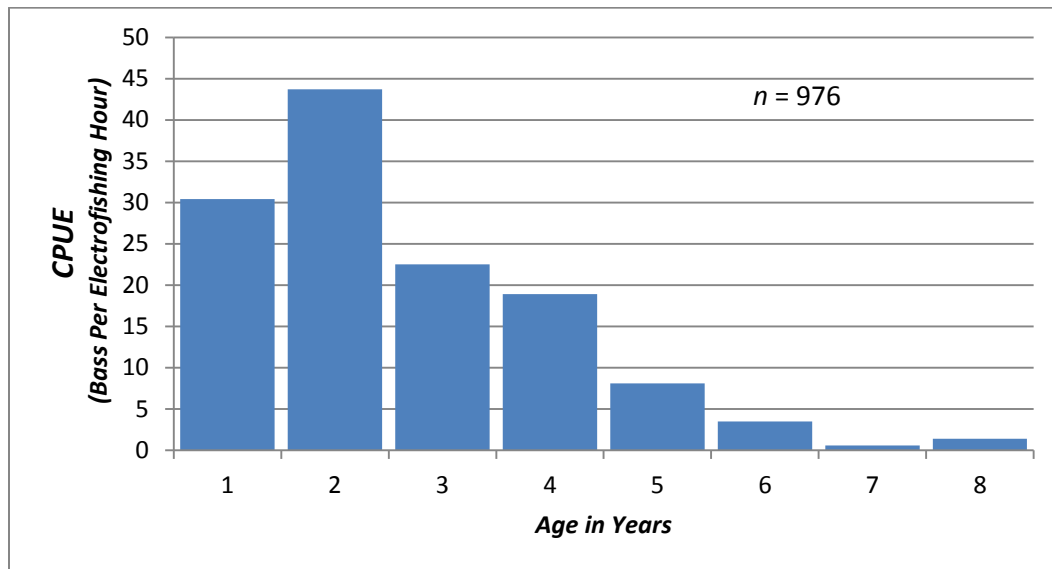


Figure 11. The age structure of Lake Concordia Bass.

Table 1. Length at age of Lake Concordia bass.

Age	Length in Inches
1.0	8.3
2.0	12.2
3.0	14.8
4.0	16.6
5.0	17.8
6.0	18.7
7.0	19.2
8.0	19.6
<i>n</i> = 407	

The rate at which fish die each year is referred to as mortality. Mortality consists of two parts: natural mortality (predation, disease) and fishing mortality (angler harvest and discard mortality). Results of the study indicate that the total mortality rate for Lake Concordia LMB is comparable to other recently sampled Louisiana lakes at 50% per year. The following example is provided to illustrate the effect. At 50% mortality, if you start with 100 age-1 Lake Concordia bass, only 6 will remain alive by age 5.

The results of this study suggest that the Lake Concordia LMB population has a total mortality that is much more influenced by natural than by fishing related mortalities (38% and 12%, respectively). The fishing mortality rate for Lake Concordia LMB is 12% per year. This rate comes from two sources; 1) harvest and 2) post release mortality. Creel survey results indicate that almost two thirds (65%) of the anglers utilizing Lake Concordia describe themselves as bass anglers. The results also suggest that these same bass anglers voluntarily release a slightly larger percentage of LMB than they harvest (54% of legal size fish are released vs. 46% retained).

Summary

It is important to note that LMB populations and their fisheries are not only influenced by fishing effort, but also by human and environmental factors. The type and degree of human activity within watersheds, riparian zones, and specific waterbodies can affect LMB populations by altering critical habitats. Additional factors influencing LMB populations include aquatic vegetation coverage, water level management, supplemental LMB stocking programs, and habitat improvements. The frequency of floods, drought, and storms can also influence LMB populations. While consideration of these factors is important in effective fisheries management, evaluating how these factors affect the Lake Concordia LMB population/fishery is beyond the scope of this report.

Length distribution, age structure, growth rate, and mortality rate were found to be at levels that provide a stable LMB population in Lake Concordia. The population is much more influenced by natural mortality than fishing related mortality. The harvest and voluntary catch and release rates in the Lake Concordia LMB fishery are nearly equal in proportion. The Lake Concordia LMB fishery is currently managed with no size restrictions and a ten fish per day harvest limit. The dynamics of the Lake Concordia LMB population and the current characteristics of Concordia Lake anglers are such that size restrictive regulations would have a relatively insignificant effect on the population.

Largemouth bass genetics-

Lake Concordia has been stocked with Florida largemouth bass (FLMB) since 1989. Stocking rates have varied from 10 to 100 per acre. Florida genome influence peaked at 38% in 1999 and appears somewhat stable at around 27%, even though the 2011 sample spiked to 38%. Florida alleles remained at 31% in 2012. Largemouth bass genetic results are found in Table 2.

Table 2. Largemouth bass genetic testing results from Lake Concordia, LA, 1994- 2012.

Year	% Northern	% Florida	% Hybrid	% Florida Influence
1994	87	4	9	13
1995	80	3	17	20
1997	65	5	30	35
1999	62	4	34	38
2002	71	3	26	29
2005	73	5	22	27
2006	72	5	23	28
2010	76	6	18	24
2011	62	10	28	38
2012	69	5	26	31

Crappie

Historically the crappie population in Lake Concordia has been low compared to many other lakes in LA. Lake Concordia habitat is not conducive to crappie production. The deep open water fluctuates very little and less than 5% of the lake has aquatic vegetation. Standing crop estimates from biomass (rotenone) samples show .79 lbs. /acre in 1992, .83 lbs. /acre in 1995, and .09 lbs. /acre in 1997. Gill netting and electrofishing results from 1997 through 2011 also indicate a low crappie population. Results of gill netting are reported in Figure 12 and electrofishing results are found in Figure 13.

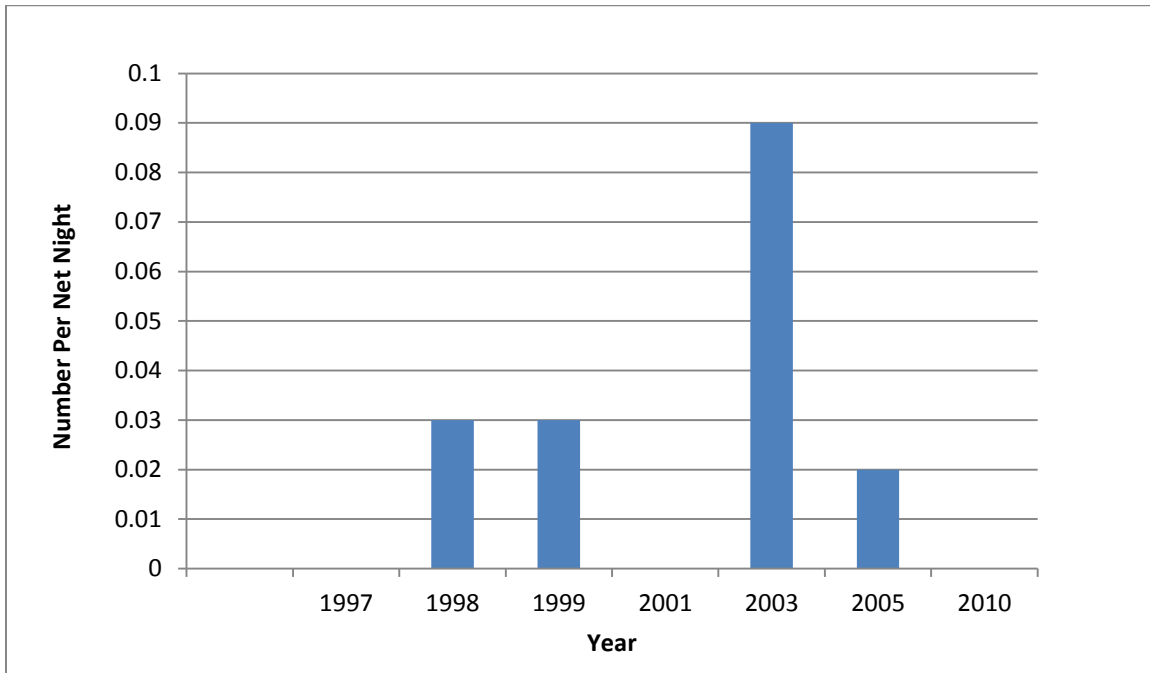


Figure 12. Crappie CPUE (number per net night) taken in gill nets from Lake Concordia, Louisiana from 1997 through 2010.

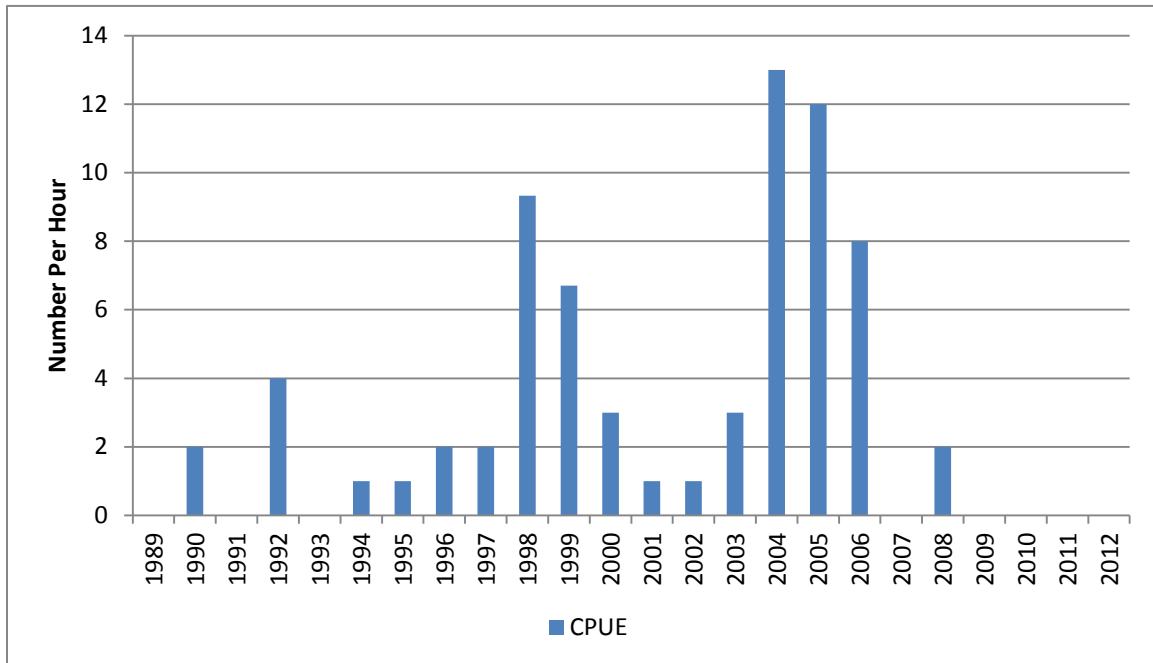


Figure 13. Total CPUE (number per hour) electrofishing trends for crappie from Lake Concordia, Louisiana from 1998 through 2012.

Forage

The most abundant forage fish species in Lake Concordia are gizzard and threadfin shad. Mississippi silversides and various minnows, shiners and darters occur in abundance. Sunfish species including bluegill and redear are also abundant. Biomass samples showed 387 lbs. /acre for 1992, 200lbs/acre for 1995, and 251 lbs. /acre for 1997 of available forage species (Figure 14).

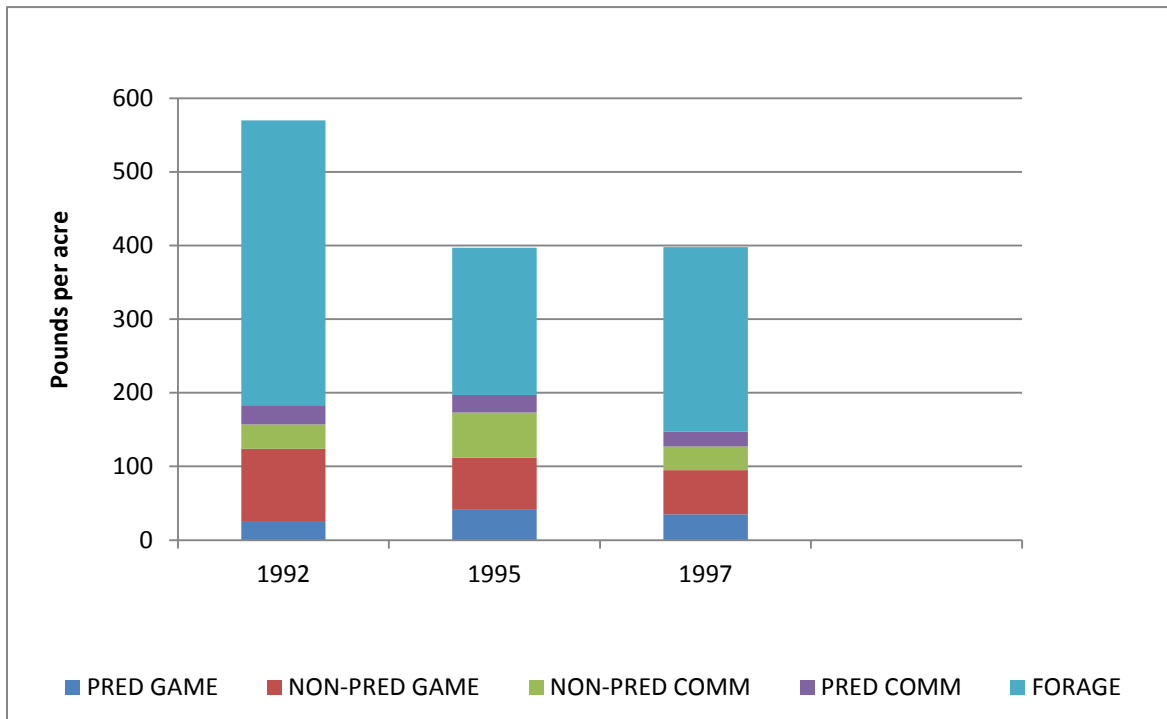


Figure 14. Biomass (standing crop) estimates of fish production in pounds per acre from Lake Concordia, Louisiana as determined from rotenone samples taken from 1992 - 1997.

Commercial Species

In September 1991, the Louisiana Wildlife and Fisheries Commission prohibited the use of gill nets, trammel nets and fish seines in Lake Concordia (Promulgated in acc. with R.S. 56:22(B)). The existing prohibition on commercial fishing gear followed the previous recreational strategy chosen for largemouth bass by providing the greatest opportunity of catching a trophy-sized fish.

A small number of commercial fishermen utilize the remaining legal commercial gear types.

Channel catfish, blue catfish, flathead catfish, freshwater drum, buffalo fish, common carp and garfish are all found in Lake Concordia. Figure 14 above shows standing crop estimates of fish species in pounds per acre from biomass (rotenone) samples taken in 1992, 1995, and 1997. Gill net and biomass sampling results for commercial species are found in Figures 15 and 16 below. A significant population of channel catfish is present. Commercial fishermen successfully harvest this species with hoop nets.

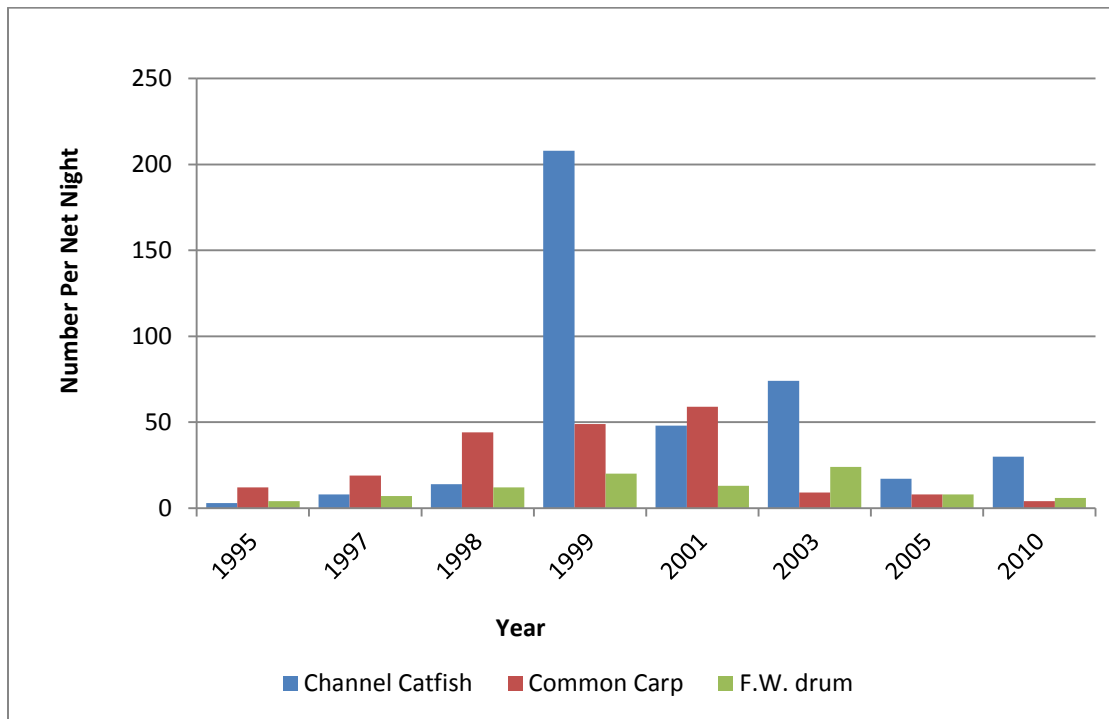


Figure 15. Catch per net night (number of fish) for channel catfish, common carp and freshwater drum collected in gill nets from Lake Concordia, LA from 1995 through 2010.

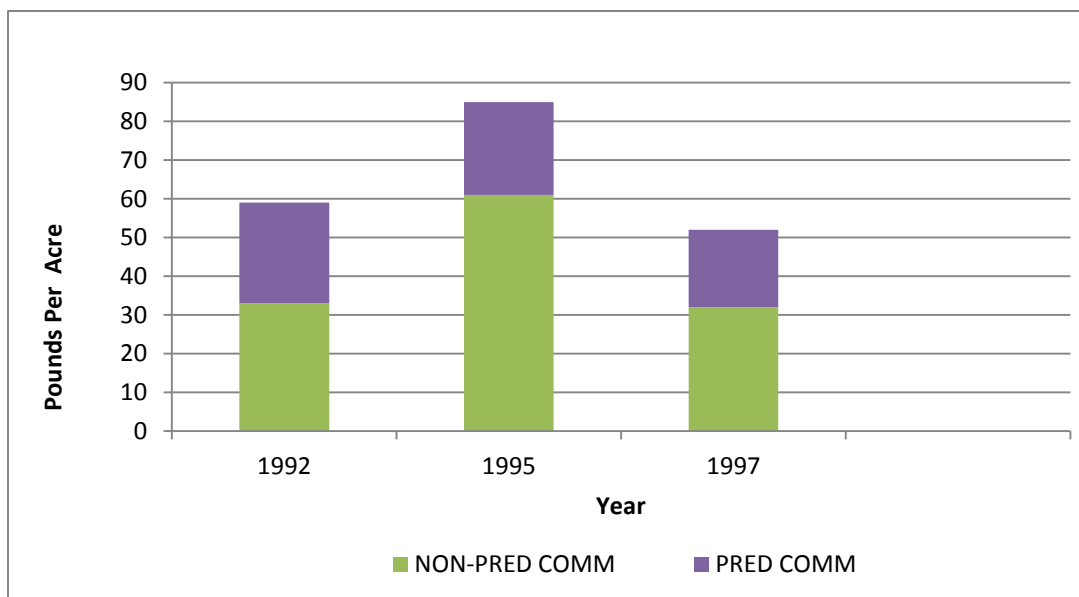


Figure 16. Standing crop estimates of fish production in pounds per acre of commercial species from Lake Concordia, Louisiana as determined from rotenone samples taken from 1992 - 1997.

HABITAT EVALUATION

Aquatic Vegetation

Historically, Lake Concordia has not had problem vegetation. The shoreline is lined with cut grass and cypress trees. At one time, both ends of the lake had an accumulation of southern naiad and coontail. Over the years, a decline of submerged vegetation has been observed. Generally, less than 5% of the lake has submergent vegetation coverage. Agricultural siltation is a potential factor. During the mid to late summer, an increase in filamentous algae growth and extensive plankton blooms are typical.

A Concordia Lake vegetation survey was conducted on August 19, 2014. No significant problem vegetation existed at that time. Potential problems related to giant salvinia will be monitored in 2015.

There was less than 50 acres of floating and emergent vegetation observed during the survey. Species present included American lotus, water hyacinth and giant salvinia. Combined coverage for all species was approximately 10 acres. There is a fringe of cutgrass along the shoreline around much of the lake. It provides erosion protection from wave action created by water recreation.

Aquatic vegetation acreage expected for 2015 should be minimal; similar to acreages listed above for 2014.

Substrate

Accretion in inactive oxbow lakes is a natural process that normally occurs very slowly. This process can be accelerated by land use practices that increase erosion and sedimentation. Conversion of bottomland hardwood forests to row crop cultivation has increased the rate and extent of soil erosion in the watershed of Lake Concordia. Though no measurements have been conducted, increased sediment contributions are suspected to be occurring at an accelerated rate. The turbidity and sedimentation associated with such contributions are a potential problem.

Artificial Structure

A large portion of the Lake Concordia shoreline is developed with piers and boat houses that have replaced the natural shoreline cover of cypress trees and aquatic vegetation. Like many oxbows, a large percentage of the surface area of the lake is open, with little complex cover. In order to provide additional cover in the open water sections of Lake Concordia, LDWF built 2 artificial reefs. The reefs are located on each side of an area of the lake known by locals as “the blue hole”. The individual reef structures are made of PVC pipe and plastic pallets and are pictured below in Figure 17. Thirty of the structures pictured below are placed at each of the designated reef sites.

Reefs are marked with buoys at Latitude and Longitude:

Reef # 1: Lat. 31.668833; Long. 91.508556

Reef # 2: Lat. 31.667944; Long. 91.509778



Figure 17. Photograph of artificial reef structures built and placed in Concordia Lake by LDWF in 2003.

CONDITION IMBALANCE / PROBLEM

Long periods of stable water conditions, increased siltation from row crops around the lake, and reduction of aquatic vegetation in the lake may be hindering the reproductive success of game species. Increased human developments, primarily residential development along the shoreline, has also increased nutrient loading in the lake, which increases algal blooms. In the future this may lead to an increase in fish kills occurring in the summer months.

Lake users disagree on the proper level to maintain the pool stage of the lake. Some users have suggested that the current pool stage be elevated to increase the amount of shallow water in the lake for fish reproduction. Shoreline property owners have expressed concern that the action would increase shoreline erosion and damage piers and boathouses. The LDWF is currently working with the Concordia Parish Police Jury and concerned user groups on the issue.

CORRECTIVE ACTION NEEDED

Periodic drawdowns mimicking natural (seasonal) fluctuations would likely help reduce some of the sediment accretion occurring in the lake. However, the small watershed makes refill in an acceptable amount of time questionable.

RECOMMENDATIONS

1. Conduct largemouth bass biological sampling on a 3 year rotation.
2. Work with the Concordia Parish Police Jury to establish an acceptable conservation pool level.
3. Continue annual stocking of hybrid striped bass to utilize available forage and provide additional sport fishing opportunities.
4. Continue spraying shoreline vegetation as complaints are received from home owners according to Aquatic Herbicide Application Procedures as adopted by the LDWF Inland Fisheries Section
5. Attend Concordia Parish Police Jury meetings as requested and at least once per year to report LDWF activities and a Lake Concordia status update.